

## **CLAIMS**

What is claimed is:

1. A computer-implemented method for debugging an operating system kernel executing on a server data processing system that is coupled to a network, the kernel including a debugger control component, and the server data processing system including a network interface card that implements a protocol stack, including layers from a physical layer through an application layer, and a debugger network component, comprising:

- detecting debugger messages received over the network in the protocol stack;
- directing the debugger messages to the debugger network component;
- communicating the debugger messages from the debugger network component to the debugger control component in the kernel; and
- performing debugging operations via the debugger control component in response to the debugger messages.

2. The method of claim 1, wherein a debugger client system is coupled to the server system and further comprising:

- communicating client messages from the debugger control component to the debugger network component;
- directing the client messages from the debugger network component to the protocol stack; and
- transmitting the client messages from the protocol stack to the client system.

3. The method of claim 2, wherein the kernel further includes a network interface subsystem, the method further comprising, for network messages that are not debugger

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- 3 messages, communicating the messages received by the protocol stack to the network  
4 interface subsystem.

- 1 4. The method of claim 1, further comprising detecting the debugger messages by a  
2 port number assigned to the debugger network component.

- 1 5. The method of claim 4, wherein the protocol stack implements a TCP/IP stack.

- 1 6. The method of claim 1, further comprising writing the debugger messages from the  
2 debugger network component to memory of the server data processing system.

- 1 7. The method of claim 1, further comprising writing the client messages from the  
2 debugger control component to memory of the server data processing system.

- 1 8. An apparatus for debugging an operating system kernel executing on a server data  
2 processing system that is coupled to a network, the kernel including a debugger control  
3 component, and the server data processing system including a network interface card that  
4 implements a protocol stack, including layers from a physical layer through an application  
5 layer, and a debugger network component, comprising:

6 means for detecting debugger messages received over the network in the protocol  
7 stack;

8 means for directing the debugger messages to the debugger network component;

9 means for communicating the debugger messages from the debugger network  
10 component to the debugger control component in the kernel; and

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means for performing debugging operations via the debugger control component in response to the debugger messages.

9. A computing arrangement for debugging an operating system kernel in a server system that is coupled to a client system via a network, comprising:  
a processor configured to execute an operating system kernel, the kernel including a debugger control component and a networking subsystem component, the debugger control component configured to perform debugging operations in response to debugger messages received over the network, and the networking subsystem configured to provide non-debugger messages to the kernel;

a network interface circuit arrangement coupled to the processor and to the memory, the network interface circuit arrangement configured with a protocol stack and a debugger network component, the protocol stack configured to detect debugger messages received over the network and direct the debugger messages to the debugger network component, and the debugger network component configured to communicate the debugger messages to the debugger control component in the kernel.

10. The arrangement of claim 9, wherein:  
the debugger control component is further configured to communicate client messages from the debugger control component to the debugger network component;  
the debugger network component is further configured to direct the client messages to the protocol stack; and  
the protocol stack is further configured to transmit the client messages to the client system.

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1 11. The arrangement of claim 10, further comprising:  
2 a first shared memory interface coupled to the debugger control component;  
3 a second shared memory interface coupled to the debugger network component,  
4 wherein the first and second shared memory interfaces are configured to write the debugger  
5 messages and client messages to a shared memory area.

1 12. The arrangement of claim 9, wherein the protocol stack is further configured to  
2 detect the debugger messages by a port number assigned to the debugger network  
3 component.

1 13. The arrangement of claim 12, wherein the protocol stack is a TCP/IP stack.

1 14. The arrangement of claim 13, wherein:  
2 the debugger control component is further configured to communicate client  
3 messages from the debugger control component to the debugger network component;  
4 the debugger network component is further configured to direct the client messages  
5 to the protocol stack; and  
6 the protocol stack is further configured to transmit the client messages to the client  
7 system.

1 15. The arrangement of claim 14, further comprising:  
2 a first shared memory interface coupled to the debugger control component;  
3 a second shared memory interface coupled to the debugger network component,  
4 wherein the first and second shared memory interfaces are configured to write the debugger  
5 messages and client messages to a shared memory area.